EMC Fibre Channel with QLogic Host Bus Adapters for the Linux v2.6.x Kernel Environment and the v8.x-Series Driver

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Preface

As part of an effort to improve and enhance the performance and capabilities of its product line, EMC from time to time releases revisions of its hardware and software. Therefore, some functions described in this document may not be supported by all revisions of the software or hardware currently in use. For the most up-to-date information on product features, refer to your product release notes.

If a product does not function properly or does not function as described in this document, please contact your EMC representative.

This guide describes the features and setup procedures for Linux host with QLogic HBAs to EMC Symmetrix and CLARiiON storage array systems.

Audience

This guide is intended for use by storage administrators, system programmers, or operators who are involved in acquiring, managing, or operating Symmetrix, CLARiiON, and host devices.

Readers of this guide are expected to be familiar with the following topics:

- Symmetrix or CLARiiON system operation
- Linux operating environment
- QLogic HBAs and drivers

Related documents

Refer to the *EMC Support Matrix* for supported server and HBA combinations. The support matrix is available at:

- *EMC Support Matrix*, available through E-Lab Interoperability Navigator at:

  `http://elabnavigator.EMC.com`

For information on Navisphere, refer to the Navisphere Management software documentation in the Documentation Library on EMC PowerLink.

http://Powerlink.EMC.com

Conventions used in this document

EMC uses the following conventions for special notices.

Note: A note presents information that is important, but not hazard-related.

CAUTION

A caution contains information essential to avoid data loss or damage to the system or equipment.

IMPORTANT

An important notice contains information essential to operation of the software.

Typographical conventions

EMC uses the following type style conventions in this document:

Normal	Used in running (nonprocedural) text for: • Names of interface elements (such as names of windows, dialog boxes, buttons, fields, and menus) • Names of resources, attributes, pools, Boolean expressions, buttons, DQL statements, keywords, clauses, environment variables, filenames, functions, utilities • URLs, pathnames, filenames, directory names, computer names, links, groups, service keys, file systems, notifications
Bold:	Used in running (nonprocedural) text for: • Names of commands, daemons, options, programs, processes, services, applications, utilities, kernels, notifications, system call, man pages Used in procedures for: • Names of interface elements (such as names of windows, dialog boxes, buttons, fields, and menus) • What user specifically selects, clicks, presses, or types
Italic:	Used in all text (including procedures) for: • Full titles of publications referenced in text • Emphasis (for example a new term) • Variables

`Courier:`	Used for: • System output, such as an error message or script • URLs, complete paths, filenames, prompts, and syntax when shown outside of running text
`Courier bold:`	Used for: • Specific user input (such as commands)
`Courier italic:`	Used in procedures for: • Variables on command line • User input variables
< >	Angle brackets enclose parameter or variable values supplied by the user
[ ]	Square brackets enclose optional values
|	Vertical bar indicates alternate selections - the bar means “or”
{ }	Braces indicate content that you must specify (that is, x or y or z)
...	Ellipses indicate nonessential information omitted from the example

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Product information — For documentation, release notes, software updates, or for information about EMC products, licensing, and service, go to the EMC Powerlink website (registration required) at:

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Technical support — For technical support, go to EMC Customer Service on Powerlink. To open a service request through Powerlink, you must have a valid support agreement. Please contact your EMC sales representative for details about obtaining a valid support agreement or to answer any questions about your account.

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Your suggestions will help us continue to improve the accuracy, organization, and overall quality of the user publications. Please send your opinion of this document to:

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1 Introduction

This document describes the procedures for installing an EMC-approved QLogic host bus adapter (HBA) into a Linux host environment and configuring the host for connection to an EMC storage array over Fibre Channel.

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Purpose of this document

This document is meant to assist in the installation and setup of QLogic Host Bus Adapters (HBAs) and the v8.x-series driver on Linux v2.6.x hosts. The focus of this document is to set up Linux hosts using the QLogic v8.x-series driver downloadable from the EMC-approved section of the QLogic website.

QLogic SANsurfer and SANsurferCLI

QLogic's SANsurfer program is a GUI-based utility and the SANsurferCLI is a text-based utility. Both applications may be installed on any Linux system and used to manage, configure, and update the EMC-approved QLogic HBAs.

Complete documentation and the EMC-qualified versions of SANsurfer and the SANsurferCLI are available for download from the EMC-approved section of the QLogic website.

`http://www.qlogic.com/support/oem_emc.asp`

For 4 GB QLogic HBAs, the minimum required versions are:

- SANsurfer - 2.0.30b52
- SANsurferCLI - 1.06.016 build 23

Host connectivity

Review the *EMC Support Matrix* or contact your EMC® representative for the latest information on qualified HBAs, drivers, and Linux distributions.

Note: EMC does not support mixing different types of Fibre Channel HBA (including different types from the same vendor) in a server.

The Fibre Channel HBA driver functions as a device driver layer below the standard Linux SCSI adapter driver. The Fibre Channel interface therefore is transparent to the Linux disk administration system.

EMC storage array-specific settings

Please refer to *Host Connectivity Guide for Linux*, available at http://Powerlink.EMC.com,for EMC storage array-specific settings.

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Installing and Configuring the QLogic HBA and v8.x-Series Driver

This chapter describes the procedures for installing an EMC-approved QLogic host bus adapter (HBA) into a Linux host and configuring the host for connection to an EMC storage array over Fibre Channel.

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Installing the HBA

Before the QLogic HBA is installed, the host must be configured with Linux. Install the Linux kernel (including sources) from the distribution installation CD by following the procedure provided in the distribution installation guide. Partition the boot drive, and select the packages and services necessary for the host. To install the QLogic HBA, follow the instructions included with your adapter. The adapter installs into a single slot.

Configuring the BIOS settings

After the HBA is installed, follow these steps during system boot to verify and configure HBA firmware settings.

To use SANsurfer or SANsurferCLI for this function refer to the SANsurfer or SANsurferCLI documentation you have downloaded.

Refer to the *EMC Support Matrix* for required BIOS versions for qualified HBAs.

Verifying the correct BIOS version

You can determine the BIOS version at boot time from the QLogic banner or from the **Fast!Util Options** menu.

- From the banner — Boot the host and watch for the banner (shown in the QLA2340 example below, with the ROM BIOS version highlighted):

```
Qlogic Corporation
QLA2312 PCI Fibre Channel ROM BIOS Version 1.42
Copyright © Qlogic Corporation 1993-2002 All rights reserved
Press <CTRL - Q> for Fast!UTIL
www.qlogic.com
```

  - If the banner displays the required version, continue to the section "EMC recommended HBA BIOS settings" on page 20.
  - If the banner does not display the required version, upgrade the firmware as described under the "Upgrading the HBA BIOS" on page 19; then proceed to "EMC recommended HBA BIOS settings" on page 20.
- From the QLogic **Fast!Util Options** menu:
  a. Boot the host. When the QLogic banner appears, press CTRL-Q to enter Fast!Util.
  b. Select **Configuration Settings** from the **Fast!Util Options** menu.
  c. Select **Adapter Settings** from the **Configuration Settings** menu.
  d. Under **Adapter Settings**, note the BIOS version:

- If the banner displays the required version, continue to "EMC recommended HBA BIOS settings" on page 20.
- If the banner does not display the required version, upgrade the firmware as described under the "Upgrading the HBA BIOS" on page 19; then proceed to "EMC recommended HBA BIOS settings" on page 20.

Upgrading the HBA BIOS

The BIOS may be upgraded using the QLogic SANsurfer GUI or SANsurferCLI text interface, or by using a DOS bootable floppy.

Upgrading the HBA BIOS using QLogic SANsurfer

The SANsurfer GUI may be downloaded from the EMC-approved section of the QLogic website. To update the BIOS using the SANsurferCLI, please refer to the QLogic provided documentation on their website for detailed instructions.

To invoke the GUI, run the following command from a terminal window:

```
/opt/QLogic_Corporation/SANsurfer/SANsurfer &
```

When upgrading the BIOS for QLogic 4 GB HBAs, the minimum required version of the QLogic SANsurfer GUI is 2.0.30b52.

Upgrading the HBA BIOS using QLogic SANsurferCLI

The SANsurferCLI (scli) is installed as part of the qlinstaller or may be downloaded from the EMC-approved section of the QLogic website. To update the BIOS using the SANsurferCLI, please refer to the QLogic provided documentation on their website for detailed instructions.

To invoke the CLI, run the following command:

```
/opt/QLogic_Corporation/SANsurferCLI/scli
```

When upgrading the BIOS for QLogic 4 GB HBAs, the minimum required version of the QLogic SANsurferCLI is 1.06.16build23.

Upgrading the HBA BIOS using the NVRAM file on a DOS bootable floppy

Follow these steps to upgrade the QLogic BIOS using the NVRAM file on a DOS bootable floppy:

1. Obtain the latest version of the BIOS from the QLogic website:
   a. Access http://www.qlogic.com.
   b. Click **Downloads** at the left side of the screen.

c. Click the **EMC** link below **OEM Models**.

d. Find the NVRAM file for the HBA(s) in your system, and click the associated **Download** link to save the file.

2. The file is a self-extracting .zip file that must be extracted to a bootable floppy diskette, as follows:

   a. Insert a diskette into a Microsoft Windows 9x machine.

   b. Open any DOS window.

   c. At the DOS prompt, format the diskette by entering:

      ```
      format /s a:
      ```

   d. At the DOS prompt, change directory (`cd`) to the location of the saved zipped file, then extract the file to the diskette.

Note: The QLogic HBA(s) must be installed in the host before proceeding.

3. Insert the BIOS upgrade installation diskette into the floppy drive.

4. Reboot the host.

5. After the host has rebooted, a DOS prompt appears. Type `flasutil /L /F` and press ENTER.

Note: The HBA BIOS upgrade might take a few minutes.

6. After the upgrade is complete, remove the diskette and reboot the host. During startup, the QLogic banner should display the new BIOS version.

EMC recommended HBA BIOS settings

EMC requires configuring the QLogic BIOS settings with the EMC-approved NVRAM settings file. This file contains all of the BIOS settings for the QLogic adapters that have been tested and approved for connection to EMC storage arrays.

Refer to the *EMC Support Matrix* for required NVRAM versions for qualified HBAs.

EMC recommended NVRAM settings for Linux

Table 1 lists the NVRAM parameters and their values. The QLogic default values are those that ship with a standard HBA that wasn't included in an EMC package. The EMC-recommended settings depend upon whether or not failover functionality is used. The settings listed under the **No Failover Functionality** heading are those that have been pre-configured in the EMC-approved NVRAM file. The settings listed under the **With PowerPath or Veritas DMP** heading are those that have been tested and determined to be applicable in a Linux environment.

The settings are configurable in NVRAM using the **Host Adapter Settings**, **Advanced Settings**, and **Extended Firmware Settings** menus. To use SANsurfer or the SANsurferCLI to modify the NVRAM settings, please refer to the SANsurfer or SANsurferCLI documentation from QLogic.

Table 1 QLogic Bios settings

		EMC recommended settings	
	QLogic default	**No Multipath functionality**	**With Multipath functionality**
Host Adapter settings			
Host Adapter BIOS	Disabled	• Disabled (No boot from SAN) • Enabled (Boot from SAN)	• Disabled (No boot from SAN) • Enabled (Boot from SAN)
Frame Size	2048	2048	2048
Loop Reset Delay	5	5	5
Adapter Hard Loop IP	Disabled	Disabled	Disabled
Hard Loop ID	0	125	125
Spin-up Delay	Disabled	Disabled	Disabled
Connection Options (topology)	2	• 1 (FC Fabric environment) • 0 (FC DAS/Loop environment)	• 1 (FC Fabric environment) • 0 (FC DAS/Loop environment)
Fibre Channel Tape Support	Enabled	Disabled	Disabled

Table 1 QLogic Bios settings (continued)

		EMC recommended settings	
	QLogic default	**No Multipath functionality**	**With Multipath functionality**
Data Rate	2	1 2 4 **Note:** Match port data rate on real environment.	1 2 4 **Note:** Match port data rate on real environment.
Advanced Adapter settings			
Execution Throttle	16	256	256
LUNs per Target	8	256	256
Enable LIP Reset	No	No	No
Enable LIP Full Login	Yes	Yes	Yes
Enable Target Reset	Yes	Yes	Yes
Login Retry Count	8	45	30
Port Down Retry Count	8	45	15
Link Down Timeout	8	45	15
Extended Error Logging	Disabled	• Disabled (Do not use debugging) • Enable (Use debugging)	• Disabled (Do not use debugging) • Enable (Use debugging)
Operation Mode	0	0	0
Interrupt Delay Timer	0	0	0
Selectable Boot settings			
Selectable Boot	Disabled	Disabled	Disabled
(Primary) Boot Port Name, LUN	WWNN*	WWNN*	WWNN*
Boot Port Name, LUN	0	0	0
Boot Port Name, LUN	0	0	0
Boot Port Name, LUN	0	0	0

The values for the **Connection Options** parameter are as follows:

- 0 for Loop Only
- 1 for Point to Point
- 2 for Loop preferred, otherwise Point to Point

Note: For Linux attach, EMC recommends setting the Connection Options parameter to 1 when attached to a fabric and to 0 when attached to an EMC Storage Array directly.

* The WWNN of the server's boot LUN must be listed in this field.

Manually setting the topology for QLogic HBAs

The EMC default setting for the topology is set to 2 (Loop preferred; otherwise, point to point).

For Linux environments, it is recommended that the Connection Options parameter be set to 1 when attached to a fabric and to 0 when attached to an EMC Storage Array directly.

Follow these steps to set the NVRAM variables for the topology:

1. Boot the host. When the QLogic banner appears, press **Ctrl-Q** to enter the **Fast!Util** menu.
2. Select **Configuration Settings** from the **Fast!Util Options** menu.
3. Select **Host Adapter Settings** from the **Configuration Settings** menu.
4. Select **Connection Options** (topology) and press **Enter**.
5. Select the appropriate topology and press **Enter**:
   - FC-AL - 0 (loop only)
   - FC-SW - 1 (point to point only)
6. Press ESC to return to the **Fast!Util Options** menu.
7. When prompted to save the changes made to the current adapter, select **Save Changes**.
8. If you have more adapters to configure, choose **Select Host Adapter** and repeat steps 2 through 7 for each adapter.
9. Press **ESC** to exit the **Fast!Util** menu.
10. Reboot the host.

Manually setting the data rate for QLogic HBAs

The EMC default setting for the data rate on the QLA23xx / QLE23xx HBAs is Auto Select mode. If necessary, the mode may be set manually to 1 GB, 2 GB, or Auto Select mode.

The EMC default setting for the data rate on the QLA24xx / QLE24xx 4 GB capable HBAs is Auto Select mode. If necessary, the mode may be set manually to 1 GB, 2 GB, or Auto Select mode.

To use SANsurfer or the SANsurferCLI to modify the NVRAM settings, please refer to the SANsurfer or SANsurferCLI documentation from QLogic.

Note: For any device connected to the HBA, set the device data rate (if applicable) before setting the HBA data rate.

Follow these steps for each QLogic HBA to be modified:

1. Boot the host. When the QLogic banner appears, press **Ctrl-Q** to enter the **Fast!Util** menu.
2. Select **Configuration Settings** from the **Fast!Util Options** menu.
3. Select **Host Adapter Settings** from the **Configuration Settings** menu.
4. Select the **Data Rate** setting and press **Enter**.
5. Select the appropriate speed for the device to which the QLA23xx HBA will connect. The options are 0 for 1 GB/s, 1 for 2 GB/s, and 2 for Auto Select.
6. Press ESC to return to the **Fast!Util Options** menu.
7. When prompted to save the changes made to the current adapter, select **Save Changes**.
8. Repeat steps 2 through 7 for each adapter.
9. Press ESC to exit the **Fast!Util** menu.
10. Reboot the host.

Configuring the Linux v2.6.x host with the QLogic v8.x-series driver

Using the QLogic adapter with the Linux operating system requires HBA driver software. The driver functions at a layer below the Linux SCSI driver to present Fibre Channel devices to the operating system as if they were standard SCSI devices.

Refer to the latest *EMC Support Matrix* for specific qualified kernel versions and distributions.

Please note that the support stated in the *EMC Support Matrix* supersedes versions listed in this document.

Installation instructions for the QLogic v8.x-series driver

Note: Only the QLogic v8.01.xx driver provides support for the 4 GB capable QLA24xx / QLE24xx-series HBAs , not the v8.00.xx driver.

Installing the QLogic v8.xx.xx drivers

The QLogic v8.xx.xx driver is supported on QLA23xx / QLE23xx-series HBAs for RHEL 4.0, RHEL 4.0 U1, and SLES 9 SP1 hosts.

The QLogic v8.01.06 driver introduces support for the 4 GB capable QLA24xx / QLE24xx-series HBAs. The v8.01.06 driver is supported only on RHEL 4.0 U2 and SLES 9 SP2 at this time.

Neither of these drivers is included in Red Hat or SuSE distributions and, therefore, they must be downloaded from the EMC-approved section of the QLogic website.

Note: Please refer to the *EMC Support Matrix* for specific kernel versions supported. Versions listed in the *EMC Support Matrix* supersede all revisions listed in this document.

Downloading the QLogic v8.x-series driver for the v2.6.x kernel

Use the following procedure to download the EMC-approved QLogic driver from the QLogic website:

1. Use a web browser to access the EMC-approved section of the QLogic website at:
   `http://www.qlogic.com/support/oem_emc.asp`
2. Depending upon the EMC Storage Array being used, select the appropriate link from one of the two following categories:
   - EMC CLARiiON, EMC Symmetrix & EMC Celerra supported software
   - EMC CLARiiON AX100 supported software
3. After selecting a category, find the HBA model being used and select the link to be transferred to the page of resources for that HBA.

4. Find the desired and supported driver for the kernel version and distribution, and click the associated **Download** link to save the file.

What next? Select a method to install the driver onto the Linux host:

For the QLogic v8.xx.xx driver:

- To create a modular v8.xx.xx driver using the DKMS RPM, refer to "Installing the QLogic v8.xx.xx Driver via the QLogic DKMS RPM: Method 1" on page 30.
- To create a modular v8.xx.xx driver using the QLogic RPM, refer to "Installing the QLogic v8.xx.xx driver via the QLogic installation script: Method 2" on page 32.

Installation methods for the QLogic v8.xx.xx driver

The QLogic v8.xx.xx driver may be installed onto a Linux host using one of the two following methods:

- Method One - Use the QLogic DKMS RPM to compile and install the modular driver for Dell servers running RHEL 4.0 systems and attached to EMC Storage Arrays.

  This method requires no manual edits for Dell servers attached to EMC Storage Arrays. By installing the DKMS RPM, the necessary files will be edited and the driver will be compiled and installed automatically.

- Method Two - Use the QLogic RPM to compile and install the modular driver for RHEL 4, SLES 9, and SLES 10.

  This method requires no manual edits for systems attached to EMC Storage Arrays. By installing the QLogic RPM, the necessary files will be edited and the driver will be compiled and installed automatically.

Note: Prior to installing the QLogic driver, processes holding the driver open must be stopped so that the currently-loaded driver may be removed from the running kernel.

Perform the following steps prior to the installation:

1. Stop all I/O.
2. Unmount all filesystems attached to the QLogic driver.
3. If the Naviagent/CLI is installed and enabled on the host, then the Naviagent/CLI service must be stopped.

   To stop the Naviagent/CLI service, issue one of the two following commands:

   ```
   /etc/init.d/naviagentcli stop
   ```

   or

   ```
   service naviagentcli stop
   ```

4. If PowerPath is installed and enabled on the host, then the PowerPath service must be stopped.

To stop the PowerPath service, issue one of the two following commands:

/etc/init.d/PowerPath stop

or

service PowerPath stop

5. If the QLogic SANsurfer daemon qlremote is installed and enabled on the host, then the qlremote service must be stopped in order for the driver to be removed from the currently running kernel.

   To stop the qlremote service, issue one of the two following commands:

   /etc/init.d/qlremote stop

   or

   service qlremote stop

Installing the QLogic v8.xx.xx Driver via the QLogic DKMS RPM: Method 1

This section guides you through the process of installing and utilizing the DKMS RPM for Dell servers running the RHEL 4.0 distribution. The DKMS RPM will build and install the QLogic driver modules and will modify the `/etc/modprobe.conf` file with the entries similar to the following:

```
options qla2xxx ql2xfailover=0
alias scsi_hostadapter2 qla2100
alias scsi_hostadapter3 qla2200
alias scsi_hostadapter4 qla2300
alias scsi_hostadapter5 qla2322
alias scsi_hostadapter6 qla6312
```

The following are example steps to integrate the QLogic driver. Please also refer to the README file in the driver package.

1. Boot into the qualified and supported kernel onto which the driver will be installed.
2. Obtain the qla2xxx-v8.xx.xx1-2dkms.tgz package from the EMC-approved section of the QLogic website as instructed under the "Downloading the QLogic v8.x-series driver for the v2.6.x kernel" on page 27.

3. Uncompress and extract the source files from the tar archive:

```
[root@l82bi205 extra]# tar zxvf
qla2xxx-v8.xx.xx-2dkms.tar.gz
```

The initial decompression will provide you with the following:

```
qla2xxx-v8.xx.xx-2/
qla2xxx-v8.xx.xx-2/qla2xxx-v8.xx.xx-2dkms.noarch.rpm
qla2xxx-v8.xx.xx-2/dkms-2.0.5-1.noarch.rpm
qla2xxx-v8.xx.xx-2/README.dkms
```

4. Install the DKMS RPM:

```
cd qla2xxx-v8.xx.xx-2
rpm -ivh dkms-2.0.5-1.noarch.rpm

Preparing...
########################################### [100%]
   1:dkms
########################################### [100%]
```

5. Install the QLogic driver RPM:

```
rpm -ivh qla2xxx-v8.xx.xx-2dkms.noarch.rpm

Preparing...
########################################### [100%]
   1:qla2xxx
########################################### [100%]
```

An example of the console output reported by the RPM driver installation is as follows:

```
Creating symlink /var/lib/dkms/qla2xxx/v8.xx.xx/source
->/usr/src/qla2xxx-v8.xx.xx
DKMS: add Completed.
Loading/Installing pre-built modules for 2.6.9-5.EL (x86_64).
```

A new ramdisk will be created automatically by the DKMS RPM installation.

6. Reboot the host.

Installing the QLogic v8.xx.xx driver via the QLogic installation script: Method 2

This section guides you through the process of installing and utilizing the QLogic installation script for RHEL 4.0 and SLES 9 SP1 distributions. The script will build and install the driver and will modify the `/etc/modprobe.conf` file on RHEL 4.0 hosts and the `/etc/modprobe.conf.local` and `/etc/sysconfig/kernel` files on SLES 8 hosts.

Note: By default, the installation script will install the QLogic HBA SNIA API libraries and the SANsurferCLI.

The following are example steps to install the QLogic driver via the installation script. Please also refer to the README file in the driver package.

1. Boot into the qualified and supported kernel onto which the driver will be installed.
2. Obtain the `qlafc-linux-8.xx.xx-1-install.tgz` package from EMC-approved section of the QLogic website as instructed under the "Downloading the QLogic v8.x-series driver for the v2.6.x kernel" on page 27.
3. Uncompress and extract the source files from the tar archive:

   `tar zxvf qlafc-linux-8.xx.xx-1-install.tgz`

   The initial decompression provides the following:

```
qlafc-linux-8.xx.xx-1-install/
qlafc-linux-8.xx.xx-1-install/scli-1.06.16-18.i386.rpm
qlafc-linux-8.xx.xx-1-install/set_driver_param
qlafc-linux-8.xx.xx-1-install/qla2xxx-v8.xx.xx-1.noarch.rpm
qlafc-linux-8.xx.xx-1-install/qlinstall
qlafc-linux-8.xx.xx-1-install/README.qlinstall
qlafc-linux-8.xx.xx-1-install/scli-1.06.16-18.ppc64.rpm
qlafc-linux-8.xx.xx-1-install/revision.notes
qlafc-linux-8.xx.xx-1-install/scli-1.06.16-18.ia64.rpm
```

4. Install the QLogic driver via the installation script provided. When using the -i switch, the driver will be compiled, the current driver will be unloaded, and the newly compiled driver will be loaded into the kernel.

Note: EMC does not support the persistent binding implementation contained within the QLogic driver. As a result, it is recommended that the driver be compiled and installed without persistent binding enabled. This can be accomplished by using the 'dp' switch with the installation script.

Proceed with the installation.

```
cd qlafc-linux-8.xx.xx-1-install/./qlinstall -i -dp
```

The qlinstall installation script provides the following features:

- Installs the driver source RPM which installs the driver source code in the following path:

  /usr/src/qlogic/<driver_version-rpm_release>

- Builds and installs the QLogic driver and configuration module (`qla2xxx_conf.o`) for the QLogic HBA model(s) installed in the system.
- Creates back-ups of important files and older drivers in the following directory:

/usr/src/qlogic/<driver version-rpm release>/backup

- Automatically loads the driver for the HBA model present.
- Builds and installs the ramdisk with the latest driver and configuration modules.
- Installs the QLogic SNIA API Library V2.
- Performs device discovery by default.
- Provides the following command line options:
  - To invoke the device discovery at a later stage.
  - To rebuild the ramdisk excluding or including QLogic HBA driver.
  - To Unload/Load driver.
  - To Update the Option ROM (BIOS, and so forth) on all HBAs.
  - To Update the NVRAM on all HBAs.
  - To pass driver parameters. For ex: `ql_port_down_retry` (Overrides NVRAM default)
  - To invoke the SANsurferCLI (SCLI).

The SANsurferCLI (SCLI) is a command line interface that provides more flexibility for performing HBA configuration, device discovery, Option ROM and NVRAM updates, etc.

RHEL 4.0 examples

An example of the console output reported by the QLogic installation script on RHEL 4.0 hosts is as follows:

```
./qlinstall -i -dp


#*********************************************************#
#             QLogic HBA Linux Driver Installation        #
#                   Version:  1.00.00b2pre9                                  #
#*********************************************************#

Kernel version: 2.6.9-5.EL
Distribution: Red Hat Enterprise Linux AS release 4 (Nahant)

Found QLogic Fibre Channel Adapter in the system
    1: QLA2312
Installation will begin for following driver(s)
    1: qla2xxx version: v8.00.03

Preparing...
##################################################
qla2xxx
##################################################

QLA2XXX -- Building the qla2xxx driver...
\

QLA2XXX -- Installing the qla2xxx modules to
/lib/modules/2.6.9-5.EL/kernel/drivers/scsi/qla2xxx/...

Setting up QLogic HBA SNIA API library...

Unloading any loaded drivers
Unloaded module qla2300
Loading module qla2xxx_conf version: v8.00.03....
Loaded module qla2xxx_conf
Loading module qla2xxx version: v8.00.03....
Loaded module qla2xxx
Loading module qla2300 version: v8.00.03....
Loaded module qla2300
Installing scli....
Preparing...
##################################################
scli
##################################################
Installation completed successfully.
```

```
Building default persistent binding using SCLI

Configuration saved on HBA port 0. Changes have been saved to
persistent storage.
Please reload the QLA driver module/rebuild the RAM disk for
the saved configuration to take effect.
Configuration saved on HBA port 1. Changes have been saved to
persistent storage.
Please reload the QLA driver module/rebuild the RAM disk for
the saved configuration to take effect.

Saved copy of /etc/modprobe.conf as
/usr/src/QLogic/v8.00.03-3/backup/modprobe.conf-2.6.9-5.EL-050505-161350.bak

Saved copy of /boot/efi/efi/redhat/initrd-2.6.9-5.EL.img as
/usr/src/QLogic/v8.00.03-3/backup/initrd-2.6.9-5.EL.img-050505-161350.bak

QLA2XXX -- Rebuilding ramdisk image...
Ramdisk created.

Reloading the QLogic FC HBA drivers....
Unloaded module qla2300
Loading module qla2xxx_conf version: v8.00.03....
Loaded module qla2xxx_conf
Loading module qla2xxx version: v8.00.03....
Loaded module qla2xxx
Loading module qla2300 version: v8.00.03....
Loaded module qla2300

Target Information on all HBAs:
===============================

-------------------------------------------------------------------------------
HBA Port 0 - QLA2342  Port Name: 21-00-00-E0-8B-19-9A-54 Port ID: 6B-0F-00
-------------------------------------------------------------------------------
Path                        : 0
Target                      : 0
Device ID                   : 0x81
Port ID                     : 49-1B-00
Product Vendor              : DGC
Product ID                  : RAID 3
Product Revision            : 0207
Node Name                   : 50-06-01-60-90-60-12-70
Port Name                   : 50-06-01-60-10-60-12-70
Product Type                : Disk
Number of LUN(s)            : 26
Status                      : Online
-------------------------------------------------------------------------------
Path                        : 0
Target                      : 1
Device ID                   : 0x82
Port ID                     : 48-1B-00
```

```
Product Vendor              : DGC
Product ID                  : RAID 3
Product Revision            : 0207
Node Name                   : 50-06-01-60-90-60-12-70
Port Name                   : 50-06-01-68-10-60-12-70
Product Type                : Disk
Number of LUN(s)            : 26
Status                      : Online
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------
HBA Port 1 - QLA2342  Port Name: 21-01-00-E0-8B-39-9A-54 Port ID: 6B-0E-00
-----------------------------------------------------------------------------
Path                        : 0
Target                      : 0
Device ID                   : 0x81
Port ID                     : 49-1B-00
Product Vendor              : DGC
Product ID                  : RAID 3
Product Revision            : 0207
Node Name                   : 50-06-01-60-90-60-12-70
Port Name                   : 50-06-01-60-10-60-12-70
Product Type                : Disk
Number of LUN(s)            : 26
Status                      : Online
-----------------------------------------------------------------------------
Path                        : 0
Target                      : 1
Device ID                   : 0x82
Port ID                     : 48-1B-00
Product Vendor              : DGC
Product ID                  : RAID 3
Product Revision            : 0207
Node Name                   : 50-06-01-60-90-60-12-70
Port Name                   : 50-06-01-68-10-60-12-70
Product Type                : Disk
Number of LUN(s)            : 26
Status                      : Online
-----------------------------------------------------------------------------

#*************************************************************#
#               INSTALLATION SUCCESSFUL!!                     #
#      QLogic HBA Linux driver installation completed.    #
#*************************************************************#
```

Files modifications on RHEL 4.0 hosts

An example of the installation script's modifications to the file `/etc/modprobe.conf` is as follows:

```
options qla2xxx ql2xfailover=0  ConfigRequired=0
remove qla2xxx /sbin/modprobe -r --first-time --ignore-remove
qla2xxx && { /sbin/modprobe -r --ignore-remove qla2xxx_conf; }
alias scsi_hostadapter1 qla2xxx_conf
alias scsi_hostadapter2 qla2xxx
alias scsi_hostadapter3 qla2300
```

SLES 9 examples

An example of the installation script's modifications to the file `/etc/modprobe.conf` is as follows:

```
./qlinstall -i -dp

#*********************************************************#
#            QLogic HBA Linux Driver Installation         #
#                  Version:  1.00.00b2pre4                #
#*********************************************************#

Kernel version: 2.6.5-7.151-smp
Distribution: SUSE LINUX Enterprise Server 9 (i586)

Found QLogic Fibre Channel Adapter in the system
    1: QLA2312
Installation will begin for following driver(s)
    1: qla2xxx version: v8.00.03

Preparing...
#################################################
qla2xxx
#################################################

QLA2XXX -- Building the qla2xxx driver...
\

QLA2XXX -- Installing the qla2xxx modules to
/lib/modules/2.6.5-7.151-smp/kernel/drivers/scsi/qla2xxx/...

Setting up QLogic HBA SNIA API library...

Unloading any loaded drivers
Unloaded module qla2300
Unloaded module qla2xxx_conf
Loading module qla2xxx_conf version: v8.00.03....
Loaded module qla2xxx_conf
Loading module qla2xxx version: v8.00.03....
Loaded module qla2xxx
Loading module qla2300 version: v8.00.03....
```

```
Loaded module qla2300
Installing scli....
Preparing...
##################################################
scli
##################################################
Installation completed successfully.

Building default persistent binding using SCLI

Configuration saved. Changes have been saved to persistent storage.
Please reload the QLA driver module/rebuild the RAM disk for the
saved configuration to take effect.
Configuration saved. Changes have been saved to persistent storage.
Please reload the QLA driver module/rebuild the RAM disk
for the saved configuration to take effect.
Saved copy of /etc/sysconfig/kernel as
/usr/src/qlogic/v8.00.03-1/backup/kernel-2.6.5-7.151-smp-042905-124100.bak

Saved copy of /etc/modprobe.conf.local as
/usr/src/qlogic/v8.00.03-1/backup/modprobe.conf-2.6.5-7.151-smp-042905-124100.ba
k

Saved copy of /boot/initrd-2.6.5-7.151-smp as
/usr/src/qlogic/v8.00.03-1/backup/initrd-2.6.5-7.151-smp-042905-124100.bak

QLA2XXX -- Rebuilding ramdisk image...
Ramdisk created.

Reloading the qlogic FC HBA drivers....
Unloaded module qla2300
Loading module qla2xxx_conf version: v8.00.03....
Loaded module qla2xxx_conf
Loading module qla2xxx version: v8.00.03....
Loaded module qla2xxx
Loading module qla2300 version: v8.00.03....
Loaded module qla2300

Target Information on all HBAs:
===============================

--------------------------------------------------------------------------------
HBA Port 1 - QLA2340  Port Name: 21-00-00-E0-8B-13-C0-1E Port ID: 6A-1A-13
--------------------------------------------------------------------------------
Path                        : 0
Target                      : 0
Device ID                   : 0x81
Port ID                     : 6A-2E-13
Product Vendor              : DGC
Product ID                  : LUNZ
Product Revision            : 0206
Node Name                   : 50-06-01-60-90-60-12-5C
```

```
Port Name                 : 50-06-01-6A-10-60-12-5C
Product Type              : Disk
Number of LUN(s)          : 1
Status                    : Online
--------------------------------------------------------------------------------
Path                      : 0
Target                    : 1
Device ID                 : 0x82
Port ID                   : 6C-1B-13
Product Vendor            : DGC
Product ID                : RAID 3
Product Revision          : 0207
Node Name                 : 50-06-01-60-90-60-12-70
Port Name                 : 50-06-01-62-10-60-12-70
Product Type              : Disk
Number of LUN(s)          : 14
Status                    : Online
--------------------------------------------------------------------------------
Path                      : 0
Target                    : 2
Device ID                 : 0x83
Port ID                   : 61-1A-13
Product Vendor            : DGC
Product ID                : RAID 3
Product Revision          : 0207
Node Name                 : 50-06-01-60-90-60-12-70
Port Name                 : 50-06-01-6A-10-60-12-70
Product Type              : Disk
Number of LUN(s)          : 14
Status                    : Online
--------------------------------------------------------------------------------
Path                      : 0
Target                    : 3
Device ID                 : 0x84
Port ID                   : 74-4A-13
Product Vendor            : DGC
Product ID                : LUNZ
Product Revision          : 0206
Node Name                 : 50-06-01-60-90-60-12-5C
Port Name                 : 50-06-01-62-10-60-12-5C
Product Type              : Disk
Number of LUN(s)          : 1
Status                    : Online
--------------------------------------------------------------------------------
Path                      : 0
Target                    : 4
Device ID                 : 0x85
Port ID                   : 74-55-13
Product Vendor            : DGC
Product ID                : LUNZ
Product Revision          : 0217
Node Name                 : 50-06-01-60-88-20-12-BB
```

```
Port Name                    : 50-06-01-60-08-20-12-BB
Product Type                 : Disk
Number of LUN(s)             : 1
Status                       : Online
-------------------------------------------------------------------------------
Path                         : 0
Target                       : 5
Device ID                    : 0x86
Port ID                      : 6A-3A-13
Product Vendor               : DGC
Product ID                   : LUNZ
Product Revision             : 0217
Node Name                    : 50-06-01-60-88-20-12-BB
Port Name                    : 50-06-01-68-08-20-12-BB
Product Type                 : Disk
Number of LUN(s)             : 1
Status                       : Online
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
HBA Port 0 - QLA2340  Port Name: 21-00-00-E0-8B-13-77-20 Port ID: 74-3B-13
-------------------------------------------------------------------------------
Path                         : 0
Target                       : 0
Device ID                    : 0x81
Port ID                      : 61-1A-13
Product Vendor               : DGC
Product ID                   : RAID 3
Product Revision             : 0207
Node Name                    : 50-06-01-60-90-60-12-70
Port Name                    : 50-06-01-6A-10-60-12-70
Product Type                 : Disk
Number of LUN(s)             : 14
Status                       : Online
-------------------------------------------------------------------------------
Path                         : 0
Target                       : 1
Device ID                    : 0x82
Port ID                      : 6A-2E-13
Product Vendor               : DGC
Product ID                   : LUNZ
Product Revision             : 0206
Node Name                    : 50-06-01-60-90-60-12-5C
Port Name                    : 50-06-01-6A-10-60-12-5C
Product Type                 : Disk
Number of LUN(s)             : 1
Status                       : Online
-------------------------------------------------------------------------------
Path                         : 0
Target                       : 2
Device ID                    : 0x83
Port ID                      : 6A-3A-13
Product Vendor               : DGC
```

```
Product ID                  : LUNZ
Product Revision            : 0217
Node Name                   : 50-06-01-60-88-20-12-BB
Port Name                   : 50-06-01-68-08-20-12-BB
Product Type                : Disk
Number of LUN(s)            : 1
Status                      : Online
------------------------------------------------------------------------------
Path                        : 0
Target                      : 3
Device ID                   : 0x84
Port ID                     : 6C-1B-13
Product Vendor              : DGC
Product ID                  : RAID 3
Product Revision            : 0207
Node Name                   : 50-06-01-60-90-60-12-70
Port Name                   : 50-06-01-62-10-60-12-70
Product Type                : Disk
Number of LUN(s)            : 14
Status                      : Online
------------------------------------------------------------------------------
Path                        : 0
Target                      : 4
Device ID                   : 0x00
Port ID                     : 74-4A-13
Product Vendor              : DGC
Product ID                  : LUNZ
Product Revision            : 0206
Node Name                   : 50-06-01-60-90-60-12-5C
Port Name                   : 50-06-01-62-10-60-12-5C
Product Type                : Disk
Number of LUN(s)            : 1
Status                      : Online
------------------------------------------------------------------------------
Path                        : 0
Target                      : 5
Device ID                   : 0x85
Port ID                     : 74-55-13
Product Vendor              : DGC
Product ID                  : LUNZ
Product Revision            : 0217
Node Name                   : 50-06-01-60-88-20-12-BB
Port Name                   : 50-06-01-60-08-20-12-BB
Product Type                : Disk
Number of LUN(s)            : 1
Status                      : Online
------------------------------------------------------------------------------

#*************************************************************#
#               INSTALLATION SUCCESSFUL!!                     #
#      QLogic HBA Linux driver installation completed.        #
#*************************************************************#
```

File modifications on SLES 9 hosts

An example of the installation script's modifications to the file `/etc/sysconfig/kernel` is as follows:

```
INITRD_MODULES="cciss reiserfs qla2xxx_conf qla2xxx
qla2300"
```

An example of the installation script's modifications to the file `/etc/modprobe.conf.local` is as follows:

```
remove qla2xxx /sbin/modprobe -r --first-time
--ignore-remove
qla2xxx && { /sbin/modprobe -r --ignore-remove
qla2xxx_conf; }
options qla2xxx ql2xfailover=0 ConfigRequired=0
```

Uninstallation methods for the QLogic v8.xx.xx driver

This section describes how to successfully uninstall the QLogic v8.xx.xx driver from a Linux host.

The method used to uninstall the driver is dependent upon the installation package:

- Method One - Using the QLogic DKMS RPM
- Method Two - Using the QLogic installation script

Uninstalling the QLogic v8.xx.xx driver via the QLogic DKMS RPM: Method 1

This section provides guidance for uninstalling the QLogic v8.xx.xx1 driver via the QLogic DKMS RPM package. The driver may be removed from the system with the 'e' switch for the RPM command.

The following are example steps to uninstall the QLogic driver. Please also refer to the README file in the driver package.

1. Verify the driver names by querying the DKMS RPMs.

```
[root@l82bi235 qla2x00-v8.xx.xx]# rpm -qa | grep dkms
qla2x00-v8.xx.xxdkms
dkms-2.0.0-1
```

2. Uninstall the QLogic driver RPM using the following command:

```
root@l82bi235 qla2x00-v8.xx.xx]# rpm -ev
qla2x00-v8.xx.xxdkms
```

   An example of the console output reported by the driver RPM removal is as follows:

3. Verify that the `/etc/modprobe.conf` and `/etc/modprobe.conf.local` files contain the information necessary for the server to boot and that a new ramdisk has been created.

4. Reboot the host.

Uninstalling the QLogic v8.xx.xx driver via the QLogic installation script: Method 2

This section provides guidance for uninstalling the QLogic v8.xx.xx driver via the QLogic installation script. The driver may be removed from the system with the 'u' switch for the `qlinstall` script.

The following are example steps to uninstall the QLogic driver. Please also refer to the README file in the driver package

1. Change to the directory where the installation script is located.

   ```
   [root@l82bi116 /]# cd /qlafc-linux-8.xx.xx-install
   ```

2. Uninstall the QLogic driver with the following command:

   ```
   [root@l82bi116  qlafc-linux-8.xx.xx-install]#
   ./qlinstall -u
   ```

   An example of the console output reported by the driver removal is as follows:

3. Verify that the /etc/modprobe.conf file contains the information necessary for the server to boot and that a new ramdisk has been created. If the ramdisk has not been created as in the example above, create one.

   ```
   cd /boot
   mkinitrd -v initrd-$1.img $1
   ```

   where $1 is the currently running v2.6.x kernel version.

   For example:

   ```
   cd /boot
   mkinitrd -v initrd-2.6.9-11.ELsmp.img 2.6.9-11.ELsmp
   ```

4. Reboot the host.

Included QLogic driver on RHEL4, SLES9, SLES10, and Asianux 2.0

Table 2 on page 45 lists the Qlogic driver versions supported with the corresponding OS updates. These driver versions are included by default in the kernel and do not require any installation.

Table 2 **Supported driver versions**

OS	Driver version
Asianux 2.0 Miracle Linux SE 4.0 RedFlag DC Server 5.0 Haansoft Linux 2006 Server	8.00.03b1 Note: Does not support the 4 Gb HBAs
RHEL4 U3 Asianux 2.0 SP1 Miracle Linux SE 4.0 SP1 RedFlag DC Server 5.0 SP1 Haansoft Linux 2006 Server SP1	8.01.02-d4
RHEL4 U4	8.01.04-d7
RHEL5	8.01.07-k1
SLES9 SP3	8.01.02-sles
SLES10	8.01.04-k

Note: QLE220 will use out of box driver for supporting RHEL4 U3/U4, SLES9 SP3, and SLES10.

QLogic v8.x-series driver parameters

The QLogic driver contains a number of parameters that may be modified to perform failover functionality or to enhance performance. The QLogic and EMC recommended values are inTable 3 and descriptions of the parameters follow the table.

The values to which these parameters are set are dependent upon the environment and the type of applications and subsequent I/O being used on the system. Currently, the values in the EMC Default Recommendations column apply to both PowerPath and non-HA connections. Please keep in mind that these are merely guidelines as each environment differs.

Note: EMC does not support the failover functionality within the QLogic driver. As a result, the parameters related to the failover functionality are not used by EMC.

The changes to the parameters will not take effect until the driver is reloaded or the host is rebooted.

Note: Note the following: 0 = disabled; 1 = enabled

Table 3 QLogic v8.x-series driver parameters

Parameters	QLogic default values	EMC default recommendations
ql2xopts	<string>	<string>
General driver parameters		
extended_error_logging	0	0
ql2xioctitltimeout	66	66
ql2xprocessrscn	0	0
ql2xprocessnotready	1	1
ql2xloginretrycount	0	0
ql2xdoinitscan	1	1

Table 3 QLogic v8.x-series driver parameters

Parameters	QLogic default values	EMC default recommendations
ql2xsuspendcount	10 6-second suspend iterations	10 6-second suspend iterations
Bind	0 (by Portname)	0(by Portname)
ConfigRequired	0	0
ql2xintrdelaytimere	10	10
ql2xenablezio	0	0
ql2xplogiabsentdevice	0 (no PLOGI)	0 (no PLOGI)
displayConfig	1	1
ql2xretrycount	20	20
qlport_down_retry	0 (uses value specified in VRAM)	0 (uses value specified in VRAM)
ql2xlogintimeout	20 seconds	20 seconds
ql2xmaxqdepth	32	32
ql2xfailover	1	0
ql2xfwloadbin	0	0
ql2xfdmienable	0 (no FDMI)	0 (no FDMI)
Failover-Specific Parameters		
MaxPathsPerDevice	8	8
MaxRetriesPerPath	3	3
MaxRetriesPerIO	(MaxRetriesPerPath * MaxPathsPerDevice) +1	(MaxRetriesPerPath * MaxPathsPerDevice) +1
qlFailoverNotifyType	0	0
ql2xlbType	0	0

Table 3 **QLogic v8.x-series driver parameters**

Parameters	QLogic default values	EMC default recommendations
ql2xexcludemodel	0	0
recoveryTime	10 seconds	10 seconds
failbackTime	5 seconds	5 seconds

Description of QLogic v8.x-series driver parameters

When attaching to CLARiiON and Symmetrix Storage Arrays, EMC recommends that the `ConfigRequired` and `ql2xfailover` parameters be set to zero.

General driver parameters

- `ql2xopts`: string that defines additional driver options and persistent binding info.
- `extended_error_logging`: defines whether to enable extended error logging.
- `ql2xioctltimeout`: defines the IOCTL timeout value in seconds for pass-through commands.
- `ql2xprocessrscn`: defines whether to enable port RSCN handling via a series of less intrusive fabric ADISC and PLOGIs.
- `ql2xprocessnotready`: defines whether the driver handles NOT_READY's.
- `ql2xloginretrycount`: defines an alternate value for the NVRAM login retry count.
- `ql2xdoinitscan`: defines whether the driver should send a signal to the SCSI mid-layer to perform a scan of the SCSI bus after the QLogic driver has loaded.
- `ql2xsuspendcount`: defines the number of 6-second suspend iterations to perform while a target returns a NOT_READY status.
- `Bind`: defines the method for target persistent binding method. If set to 0, then the Portname will be used; if set to 1, the PortID will be used.
- `ConfigRequired`: If set to 1, then only devices configured and passed through the ql2xopts parameter will be presented to the OS.

- `ql2xintrdelaytimer`: defines the amount of time for the firmware to wait before generating an interrupt to the host as notification of the request completion.
- `ql2xenablezio`: defines whether to enable ZIO functionality.
- `ql2xplogiabsentdevice`: defines whether to enable a PLOGI to devices that are not present after a fabric scan. This is needed for several broken switches.
- `displayConfig`: defines whether to display the current driver configuration. If 1, then the configuration used in `/etc/modprobe.conf` will be displayed.
- `ql2xretrycount`: defines the maximum number of SCSI mid-layer retries allowed per command.
- `qlport_down_retry`: defines the maximum number of command retries to a port that returns a PORT DOWN status.
- `ql2xlogintimeout`: defines the login timeout value in seconds, during the initial login.
- `ql2xmaxqdepth`: defines the maximum queue depth reported to the SCSI mid-layer per device and specifies the number of outstanding requests per LUN.
- `ql2xfailover`: determines whether the failover functionality is disabled or enabled.

Note: EMC does not support the failover functionality of the QLogic driver.

- `ql2xfwloadbin`: enables the ability to load the HBA firmware via the request_firmware() hotplug interface.
- `ql2xfdmienable`: defines whether FDMI registration is enabled.

Failover-specific parameters

- `MaxPathsPerDevice`: defines the maximum number of paths to a device.
- `MaxRetriesPerPath`: defines the number of retries to perform on the current path before failing over to the next path in the list.
- `MaxRetriesPerIo`: defines the total number of retries to perform before failing the command and returning a `DID_NO_CONNECT` selection timeout to the OS.
- `qlFailoverNotifyType`: defines the type of failover notification mechanism to use when a failover or failback occurs.

- `ql2xlbType`: defines the load balancing method for the driver. If set to 0, then all LUNs will be exposed on the first active path. If set to 1, then the load will be balanced across all active optimized controller ports.
- `ql2xexcludemodel`: defines HBA models to be excluded from being marked as available for failover functionality.
- recoveryTime: defines the recovery time in seconds required before commands may be sent to a target device after a failback is performed.
- `failbackTime`: defines the delay in seconds before a failback is performed to ensure that all paths are available

Setting the parameter values

The values of the general driver parameters may be modified at the driver load time. This modification may be performed at the command line or by adding the parameters to the `/etc/modprobe.conf` file on RHEL 4.0 hosts and the `/etc/modprobe.conf.local` file on SLES 9 hosts and including them in the ramdisk.

Note: When attaching to CLARiiON and Symmetrix Storage Arrays, EMC recommends that the ConfigRequired and ql2xfailover parameters be set to zero in the /etc/modules.conf file.

- To load the QLogic driver onto the system with the parameters at the command line, use:

```
modprobe qla2300 ConfigRequired=0 ql2xfailover=0
```

- In order for the modular driver to be loaded at boot time with these parameters set to 0, a separate options line needs to be added to the `/etc/modprobe.conf` file on RHEL 4.0 hosts and the `/etc/modprobe.conf.local` file on SLES 9 hosts.

1. Edit the file appropriate for the distribution being used.
   - For Red Hatdistributions, edit:

```
vi /etc/modprobe.conf
```

   - For SuSE distributions, edit:

```
vi /etc/modprobe.conf.local
```

2. Add the `options` line for the appropriate driver settings.

   `options qla2xxx ConfigRequired=0 ql2xfailover=0`

   For example, the `/etc/modprobe.conf` file on RHEL 4.0 might look as follows:

   ```
   alias eth0 tg3
   alias eth1 tg3
   alias scsi_hostadapter megaraid_mbox
   alias scsi_hostadapter2 qla2xxx
   alias scsi_hostadapter3 qla2xxx_conf
   alias scsi_hostadapter4 qla2300
   options qla2xxx ConfigRequired=0 ql2xfailover=0
   ```

   And the `/etc/modprobe.conf.local` file on SLES 9 might look as follows:

```
options qla2xxx ConfigRequired=0 ql2xfailover=0
```

3. After the modification to the file appropriate for your distribution, a new ramdisk needs to be created and the host rebooted.

   - For Red Hat distributions, use:

     `cd /boot`
     `mkinitrd -v initrd-$1.img $1`

     where $1 is the currently running v2.6.x kernel version.

     For example:

     ```
     cd /boot
     mkinitrd -v initrd-2.6.9-22.ELsmp.img
     2.6.9-22.ELsmp
     ```

   - For SuSE distributions, use:

     `cd /boot`
     `mkinitrd -i initrd-$1 -k vmlinuz-$1`

     where $1 is the currently running v2.6.x kernel version.

     For example:

     ```
     cd /boot
     mkinitrd -i initrd-2.6.5-7.201smp -k
     vmlinuz-2.6.5-7.201smp
     ```

4. Reboot the host.

Displaying the QLogic v8.x-series driver parameter information via modinfo

The QLogic v8.x-series driver parameters and their definitions may be viewed by using the `modinfo` command. This command may be used on any Linux kernel module.

Note: EMC does not support the failover functionality of the QLogic driver.

The `modinfo` command may be run on the `qla2300`, `qla2xxx_conf`, and `qla2xxx` modules. However, the parameter information is reported only by the `qla2xxx` module.

An example of the console output displayed when `modinfo` is run on the `qla2300` module is as follows:

```
[root@l82bi205 ~]# modinfo qla2300
filename:
/lib/modules/2.6.9-22.ELsmp/kernel/drivers/scsi/qla2xxx/qla2300.ko
version:        8.01.06
license:        GPL
description:    QLogic ISP23xx FC-SCSI Host Bus Adapter driver
author:         QLogic Corporation
alias:          pci:v00001077d00002312sv*sd*bc*sc*i*
alias:          pci:v00001077d00002300sv*sd*bc*sc*i*
depends:        qla2xxx
vermagic:       2.6.9-22.ELsmp SMP gcc-3.4
```

An example of the console output displayed when `modinfo` is run on the `qla2xxx` module is as follows:

```
[root@l82bi205 ~]# modinfo qla2xxx
filename:
/lib/modules/2.6.9-22.ELsmp/kernel/drivers/scsi/qla2xxx/qla2xxx.ko
version:        8.01.06
license:        GPL
description:    QLogic Fibre Channel HBA Driver
author:         QLogic Corporation
parm:           ql2xfdmienable:Enables FDMI registratons Default is 0 - no FDMI.
1 - perfom FDMI.
parm:           ql2xfwloadbin:Option to enable loading of ISP24xx firmware via the
request_firmware() (hotplug) interface.  If enabled, a file, ql2400_fw.bin,
(containing the firmware image) should be hotplug accessible.
parm:           extended_error_logging:Option to enable extended error logging,
Default is 0 - no logging. 1 - log errors.
parm:           ql2xioctltimeout:IOCTL timeout value in seconds for pass-thur
commands. Default is 66 seconds.
parm:           ql2xprocessrscn:Option to enable port RSCN handling via a series
of lessfabric intrusive ADISCs and PLOGIs.
```

```
parm:          ql2xprocessnotready:Option to disable handling of NOT-READY in the
driver. Default is 1 - Handled by the driver. Set to 0 - Disable the handling
inside the driver
parm:          ql2xloginretrycount:Specify an alternate value for the NVRAM login
retry count.
parm:          ql2xdoinitscan:Signal mid-layer to perform scan after driver load:
0 -- no signal sent to mid-layer.
parm:          ql2xsuspendcount:Number of 6-second suspend iterations to perform
while a target returns a <NOT READY> status.  Default is 10 iterations.
parm:          Bind:Target persistent binding method: 0 by Portname (default); 1
by PortID; 2 by Nodename.
parm:         ConfigRequired:If 1, then only configured devices passed in through
theql2xopts parameter will be presented to the OS
parm:           ql2xintrdelaytimer:ZIO: Waiting time for Firmware before it
generates an interrupt to the host to notify completion of request.
parm:           ql2xenablezio:Option to enable ZIO:If 1 then enable it otherwise
use the default set in the NVRAM. Default is 0 : disabled
parm:           ql2xplogiabsentdevice:Option to enable PLOGI to devices that are
not present after a Fabric scan.  This is needed for several broken
switches.Default is 0 - no PLOGI. 1 - perfom PLOGI.
parm:           displayConfig:If 1 then display the configuration used in
/etc/modprobe.conf.
parm:           ql2xretrycount:Maximum number of mid-layer retries allowed for a
command.  Default value is 20,
parm:          qlport_down_retry:Maximum number of command retries to a port that
returnsa PORT-DOWN status.
parm:           ql2xlogintimeout:Login timeout value in seconds.
parm:           ql2xmaxqdepth:Maximum queue depth to report for target devices.
parm:          ql2xtgtemul:Enable/Disable target combining emulation.Default : 1
Enable target failover emulation for targets created by lunid matching       : 0
Disable target failover emulation
parm:         ql2xexcludemodel:Exclude device models from being marked as failover
capable.Combine one or more of the following model numbers into an exclusion mask:
0x20 - HSV210, 0x10 - DSXXX, 0x04 - HSV110, 0x02 - MSA1000, 0x01 - XP128.
parm:          ql2xlbType:Load Balance Method : (0) None (1) static load balance
and Default : 0  All the luns exposed on the first active path        : 1  For
static load balance across active optimised                 controller ports
parm:           qlFailoverNotifyType:Failover notification mechanism to use when
a failover or failback occurs.
parm:           MaxRetriesPerIo:How many total retries to do before failing the
command and returning to the OS with a DID_NO_CONNECT status.
parm:          MaxRetriesPerPath:How many retries to perform on the current path
before failing over to the next path in the path list.
parm:          MaxPathsPerDevice:Maximum number of paths to a device.  Default 8.
parm:           failbackTime:Delay in seconds before a failback is performed.
parm:           recoveryTime:Recovery time in seconds before a target device is
sent I/O after a failback is performed.
parm:           ql2xfailover:Driver failover support: 0 to disable; 1 to enable.
alias:          pci:v00001077d00002432sv*sd*bc*sc*i*
alias:          pci:v00001077d00002422sv*sd*bc*sc*i*
depends:        scsi_mod
vermagic:       2.6.9-22.ELsmp SMP gcc-3.4
```

Additional notes

Device reconfiguration: procedures

The Linux v2.6.x kernel lacks a command built into the kernel that allows for a dynamic SCSI bus reconfiguration such as drvconfig or ioscan.

The SCSI bus may be rescanned with a system reboot, or with a removal and reinsertion of the modular driver. In either case, all I/O must be stopped and all other mounted filesystems must be unmounted before rebooting or removing the modular driver.

Note: In the Linux v2.6.x kernel, the HBA numbers will increment in the /proc filesystem with each re-insertion of the QLogic driver.

Rebooting the host

Rebooting the host allows for reliable detection of newly added devices. The host may be rebooted after all I/O has stopped.

Unloading and reloading the modular QLogic driver

- Stop all I/O.
- Unmount all file systems attached to the QLogic driver.
- f the Naviagent/CLI is installed and enabled on the host, then the Naviagent/CLI service must be stopped.

  To stop the Naviagent/CLI service, issue one of the two following commands:

  ```
  /etc/init.d/naviagentcli stop
  ```

  or

  ```
  service naviagentcli stop
  ```

- If PowerPath is installed and enabled on the host, then the PowerPath service must be stopped.

  To stop the PowerPath service, issue one of the two following commands:

```
/etc/init.d/PowerPath stop
```

or

```
service PowerPath stop
```

- If the QLogic SANsurfer daemon `qlremote` is installed and enabled on the host, then the `qlremote` service must be stopped in order for the driver to be removed from the currently running kernel.

  To stop the qlremote service, issue one of the two following commands:

  ```
  /etc/init.d/qlremote stop
  ```

  or

  ```
  service qlremote stop
  ```

The **modprobe** command is a wrapper or an extension to **insmod** and **rmmod**. The **modprobe** command uses and maintains a set of files that describe all the modules that are available for the current kernel in `/lib/modules`.

The **modprobe** command can be used to load and unload an entire set of modules. (A *set* of modules can be a single module or a stack of dependent modules.) The command automatically loads all of the modules needed in a module stack based on the information in `modules.dep`.

Note: EMC recommends using `modprobe` to load and unload the QLogic modular driver.

The loading of the module is accomplished with either **modprobe** or **insmod**. These commands are used to install loadable kernel modules into a running kernel. The commands will attempt to link a module into the running kernel by resolving the symbols from the kernel exported symbol table.

The unloading of the module can be accomplished with the **modprobe** (with the `-r` switch) command or the **rmmod** command. These commands are used to unload the loadable modules from the running kernel if they are not in use and if other modules are not dependent upon them.

The v8.x series driver consists of multiple modules. For example, if the command **lsmod** is invoked on a server with a QLA2340-E-SP HBAs installed, the following three modules will be reported:

- `qla2xxx_conf` - The QLogic Linux driver configuration module containing information regarding persistent binding.
- `qla2xxx` - The low level QLogic Linux HBA driver module.
- `qla2300` - The QLogic Linux HBA firmware loader / personality module for that particular HBA model.

The Linux operating system may panic if any of the following three commands are invoked prior to performing the procedure in the "Unloading and reloading the modular QLogic driver" on page 54 to prepare for removing the driver.

- `modprobe -r qla2300`
- `modprobe -r qla2xxx_conf`
- `rmmod qla2300`

Device reconfiguration: Device numbering

In the Linux kernel, the SCSI addresses are not used in the device names as they are in other types of UNIX (Sun, SGI, HP-UX, and BSD, for example). Block device filenames take the form `/dev/sd ln`, where `l` is the letter denoting the physical drive and `n` is the number denoting the partition on that physical drive. Disk device file names and major and minor numbers are assigned dynamically at boot time or device loading time in the order of discovery.

Depending upon the hardware configuration, if a device is added and the system rebooted, the device numbering might change, possibly rendering the host's mount table inaccurate. For the most consistent results and to reduce the possibility of mount table inaccuracies, new devices should be appended (if possible) to the list of already attached devices. For example, if the host contains multiple HBAs, it would be best to append the new device to the last HBA and to the end of the device list attached to that HBA. This would eliminate the need to alter the preexisting entries in the mount table, since the new device could be appended to that as well.

If a new device were added to the first out of two HBAs and the system rebooted, the devices all shift by one number and the mount table entries would also need to be shifted by one device. If there is only one HBA, the new device can more easily be appended to the list

of the regularly attached devices and the mount table altered accordingly.

HPQ server-specific note

When using HPQ systems, it is highly recommended that the HPQ SmartStart CD be run to configure the HPQ server prior to installing the Linux operating system. The SmartStart CD is shipped by HPQ with their systems and is a bootable CD that is used to configure HPQ servers. If another operating system is selected other than Linux, there may be problems installing the operating system or using the drivers installed in the kernel.

Follow these steps to select Linux as the primary operating system from the HPQ SmartStart CD:

1. Boot the HPQ server using the SmartStart CD.
2. Select the **System Configuration Utility**.
3. After the System Configuration Utility has started, a dialog titled **Steps in Configuring Your Computer** appears, with the following options listed:

   Step 1: Important System Configuration Information
   Step 2: Add or Remove Boards
   Step 3: View or Edit Details
   Step 4: Examine Switches or Print Report
   Step 5: Save and Exit

   Select **Step 3: View or Edit Details**.
4. In the new window, select **Primary Operating System** (the first item in the list); then select **Unix** from the list of possibilities.
5. Another list of UNIXes appears; select **Linux** from this list.
6. Select **Enter**; then select **<F10> Done**.
7. The console returns to the **Steps in Configuring Your Computer** dialog. Select **Step 5: Save and Exit**.

   When prompted, select **Save the configuration and restart the computer**.
8. When prompted again to save your configuration and reboot, press **Enter** to reboot the system.
9. You may then proceed with installing your operating system.

(CLARiiON Only) disconnected ghost LUNs

When a Linux host is attached to both SPs in a CLARiiON storage array, the driver will report a disconnected LUN 0 on SPB and a failure to read the capacity of the device. The Navisphere Host Agent requires that disconnected LUN 0 be reported properly. A device file name is allocated to the disconnected LUN 0 in the `/dev` filesystem, but the device cannot be mounted, partitioned, or otherwise accessed.

Here is an example of a disconnected LUN 0 being reported:

```
Jul 17 14:35:57 l82bi134 kernel: sdb : READ CAPACITY failed.
Jul 17 14:35:57 l82bi134 kernel: sdb : status = 1, message = 00, host = 0,
driver = 28
Jul 17 14:35:57 l82bi134 kernel: Current sd00:00: sense key Illegal Request
Jul 17 14:35:57 l82bi134 kernel: Additional sense indicates Logical unit not re
dy,cause not reportable
Jul 17 14:35:57 l82bi134 kernel: sdb : block size assumed to be 512 bytes, disk
size 1GB.
Jul 17 14:35:57 l82bi134 kernel: sdb: I/O error: dev 08:10, sector 0
Jul 17 14:35:58 l82bi134 kernel: I/O error: dev 08:10, sector 2
Jul 17 14:35:58 l82bi134 kernel: I/O error: dev 08:10, sector 4
Jul 17 14:35:58 l82bi134 kernel: I/O error: dev 08:10, sector 6
Jul 17 14:35:58 l82bi134 kernel: I/O error: dev 08:10, sector 0
Jul 17 14:35:58 l82bi134 kernel: I/O error: dev 08:10, sector 2
Jul 17 14:35:58 l82bi134 kernel: I/O error: dev 08:10, sector 4
Jul 17 14:35:58 l82bi134 kernel: I/O error: dev 08:10, sector 6
Jul 17 14:35:58 l82bi134 kernel: unable to read partition table
```

3

Configuring a Boot Device on an EMC Storage Array

EMC supports booting Linux from an EMC storage array through an EMC-qualified QLogic Fibre Channel HBA. (Refer to the *EMC Support Matrix f*or specific HBAs, BIOS revisions, and drivers.)

- Cautions and restrictions for booting from EMC storage array.. 60
- Common limitations 62
- Configuring a Symmetrix boot device 65
- Configuring a CLARiiON boot device 68

Cautions and restrictions for booting from EMC storage array

CAUTION

If Linux loses connectivity long enough, the disks disappear from the system. To prevent further data from being lost in a situation like this, EMC recommends that the error behavior be changed from *continue* to *remount read-only*. To make this change, consult the manpage for tune2fs. A hard reboot is required to bring the system back to a usable state.

CAUTION

You should configure the host with enough memory to eliminate the need for a swap partition. EMC cannot recommend an amount of memory as this varies greatly depending upon the environment.

EMC recommends shutting down the host server during any maintenance procedures that could make the boot disk unavailable to the host.

Any of these events could crash a system booting from an EMC storage array:

CLARiiON-specific cautions and restrictions:

- Lost connection to CLARiiON Storage Array (pulled or damaged cable connection).
- CLARiiON service and upgrade procedures, such as on-line CLARiiON FLARE upgrades and / or configuration changes.
- CLARiiON SP failures, including failed lasers.
- CLARiiON Storage Array power failure.
- Storage Area Network failures, such as failures in Fibre Channel switches, switch components, or switch power.
- Storage area network service and upgrade procedures, such as firmware upgrades or hardware replacements.
- Trespass of a CLARiiON LUN from one SP to the other.

Symmetrix-specific cautions and restrictions

- Lost connection to Symmetrix Storage Array (pulled or damaged cable connection).
- Symmetrix service and upgrade procedures, such as on-line Symmetrix microcode upgrades and/or configuration changes.
- Symmetrix director failures, including failed lasers.
- Symmetrix Storage Array power failure.
- Storage area network service and upgrade procedures, such as firmware upgrades or hardware replacements.

Common limitations

Boot configurations must not deviate from the following limitations established by EMC:

- The EMC Storage device must have enough disk space to hold the Linux operating system.
- A maximum of 32 volumes may be configured on the EMC Storage Array port that will be used to boot Linux.
- EMC recommends that you install, rather than upgrade, the kernel-source and kernel UP, SMP, and Hugemem RPMs.
- For RHEL4 U4, 4 Gb HBA driver will not load automatically at boot time. The adapter will not detect boot LUN and give no device found error.

  To force load 4 Gb driver, at the point where it says no device found, click on **ADD DEVICE**, then select **QLA2400**.
- VERITAS VxVM/DMP is not supported on Linux hosts booting from EMC Storage Arrays.
- Hosts booting from an EMC Storage Array are limited to the use of one HBA.
- EMC recommends, although it is not required, that the Symmetrix or CLARiiON device that is to contain the Master Boot Record (MBR) for the host have a lower logical unit number (LUN) than any other device visible to the host.

  Note that this includes the following cases:

  - Volume Logix database device when using Volume Logix in a Symmetrix environment — The installer will fail to write the MBR to this device, as it is write-protected.
    - To force the installer to avoid an attempt to write to this device, EMC recommends masking the LUN. The administrative host must first initialize the Volume Logix database. The LUN may then be masked by modifying the active configuration file to enable the 'fba flag2' to restrict access to the Volume Logix database.
    - An alternative to masking the VCM DB is to map the Volume Logix database device so that it is the highest LUN presented to the host. Please be aware that the LUN number should not be higher than 254 (FE).

Note: The EMC-recommended method is to use LUN masking.

- CLARiiON ghost LUN — If the LUN 0 presented to a SCSI path is not owned by the SP attached to that path, a disconnected LUN 0 (ghost LUN) will be presented. The ghost LUN is not write-enabled so that the MBR cannot be written to it. Always ensure that the boot LUN is owned by the correct SP and does not trespass at any time; trespass of the boot LUN would result in a system crash.

- When attaching the Linux host to an EMC Storage Array, use the adapter in the lowest-numbered PCI slot in the server. To keep the configuration and installation simple, it is recommended that only that single HBA be cabled to the arrays. Ensure that the boot BIOS has been applied to the HBA.
- The installer installs the boot block onto only the first disk it sees. This includes SCSI and IDE drives in the server. If only EMC Storage Array devices attached to the system, the boot BIOS should be set to the first LUN the HBA sees. If there are other local disks in the system and depending on how Linux discovers the controllers and drives, the boot block may need to be on a local disk.

CLARiiON-specific limitations

- Prior to the installation on a CLARiiON LUN, the Linux host must have been manually registered on the array and assigned to a Storage Group. At least one LUN must be bound to the host's Storage Group and owned by the SP connected to the HBA being used for the fabric boot. The CLARiiON Storage Array SP should be zoned to the lowest-numbered channel in the server and the lowest-numbered path to the boot LUN must be the active path.
- EMC recommends, although it is not required, that the boot LUN be assigned Host LUN ID 0.
- During the installation procedure, it is recommended, but not required, that only one LUN be assigned to the Storage Group for ease of use. Once the installation has completed, additional LUNs may be added to the Storage Group.

- Booting from the SAN requires the use of a Navisphere Management station with the Navisphere Manager or NaviCLI installed. The stations must be separate from the boot server, but networked to the CLARiiON Storage Array.

Symmetrix-specific limitations:

- When attached to a Symmetrix, the physical-to-logical split must be 1:8 or less (1:7, 1:6, etc.). EMC supports the use of any LUN from 00 through FF as a boot disk.
- Prior to the installation on a Symmetrix LUN, the Linux host HBA must have successfully logged into the array. Using Solutions Enabler from another system, assign a minimum of one LUN to the host.
- During the installation procedure, it is recommended, but not required, that only one LUN be assigned to the host for ease of use. Once the installation has completed, additional LUNs may be assigned to the host.

Configuring a Symmetrix boot device

This section describes how to install an EMC-qualified version of Linux onto an EMC Symmetrix Storage Array connected to an Intel-based x86 and x86_64 class systems and AMD Opteron-based x86_64 class systems.

Preparing the Symmetrix storage array

- It is recommended that Volume Logix be enabled on the Symmetrix Storage Array for LUN masking purposes.
- During the installation procedure, only one LUN should be allocated to the host, so that the boot LUN may be identified easily. After the OS installation, additional LUNs may be allocated.
- Create a zone that includes the WWPN of the HBA to be used and one FA port. Add the newly-created zone to the zone configuration in the fabric and enable the zone configuration.

Preparing the host

- Create a zone that includes the WWPN of the HBA to be used and one FA port. Add the newly-created zone to the zone configuration in the fabric and enable the zone configuration.
- The PCI Fibre Channel HBA must be the lowest-numbered PCI slot in the server. For example, if there are three adapters in the system in slots 2, 4, and 5, connect the cable to the adapter in slot. Do not connect cables to other adapters until the installation is complete and the host rebooted.
- SCSI hard disks are allowed in SAN boot configurations. However, the BIOS for the disk's SCSI adapters must be disabled. Any SCSI disks attached to the host should be disconnected during the operating system installation.
- For servers with SCSI CD-ROM drives, ensure that the BIOS is enabled on the SCSI channel that includes the CD-ROM. Disable the BIOS on any other integrated SCSI channels.
- For servers with IDE CD-ROM drivers, disable the BIOS on the server's integrated SCSI adapter(s). The SCSI BIOS is not required to boot from the CD-ROM.

- Disable the BIOS on any other HBAs in the system other than the QLogic HBA designated for booting.

Configuring the QLogic BIOS for SAN boot

After the BIOS is installed and enabled, it must be configured for use for booting from the SAN. The following procedure describes how to configure the BIOS.

1. Connect the Symmetrix fibre channel port to the adapter in the lowest-numbered PCI slot in the server. For example, if there are three adapters in the system in slots 2, 4, and 5, connect the cable to the adapter in slot. Do not connect cables to the other adapters at this time.
2. Boot the server, and press **Ctrl-Q** when the QLogic banner is displayed.

   Note: Different HBA models may display different banners. Be sure to press **Ctrl-Q** for the HBA to be configured.

   The banner display corresponds to the BIOS revision pertinent to the HBAs currently installed. Refer to the *EMC Support Matrix* for specific HBAs and BIOS revisions.
3. After Fast!UTIL loads, the display depends on whether there are multiple QLogic HBAs installed:
   - If there is only one QLogic HBA, the **Fast!UTIL Options** menu appears.
   - If there are multiple QLogic HBAs, a list of addresses occupied by those HBAs appears. Since the EMC storage array is attached to the lowest-numbered PCI slot, select the first adapter from the list; then press ENTER. The **Fast!UTIL Options** menu appears.
4. From the **Fast!UTIL Options** menu, select **Configuration Settings** and press **Enter**.

5. From the **Configuration Settings** menu, select **Adapter Settings** and press **Enter**.
6. From the **Host Adapter Settings** menu, select **Host Adapter BIOS** and press **Enter** to enable it if it is not already enabled.

   Note: Refer to the Table 1 on page 21 for recommended settings.

7. Press **ESC** to exit the **Configuration Settings** menu.
8. From the **Configuration Settings** menu, select **Selectable Boot Settings** and press **Enter**.
9. From the **Selectable Boot Settings** menu, select **Selectable Boot Device** and press **Enter** to enable this option if it is not already enabled.
10. Select **Current Boot Node Name** and press **Enter**.

    The adapter will scan for attached storage devices which will be displayed on the screen.
11. Choose the Symmetrix Storage Array port from which the system will boot. Its entry will be similar to the following:

12. A list of LUNs will be displayed in a new window. Select the LUN to be used as the boot device and press ENTER.

    Note: On Symmetrix Storage Arrays, the LUN number of the first visible device to that port should be used.

13. Press **ESC** in the **Selectable Boot Settings** menu to return to the **Configuration Settings** menu.
14. Press **ESC** in the **Configuration Settings** menu to return to the **Options** menu.
15. Select **Save Changes** and press **Enter**.
16. Press **ESC** to exit the **Fast!UTIL** menu.
17. Reboot the host.

Configuring a CLARiiON boot device

This section describes how to install an EMC-qualified version of Linux onto an EMC CLARiiON Storage Array connected to an Intel-based x86 and x86_64 class systems and AMD Opteron-based x86_64 class systems.

Preparing the CLARiiON storage array

- It is recommended that Access Logix be enabled on the CLARiiON Storage Array for LUN masking purposes.
- Boot device support requires a Navisphere Management station with Navisphere Manager or CLI installed. The station must be separate from the server being installed and must be networked to the CLARiiON.
- Before installing Linux onto an EMC CLARiiON Array, the array must have one bound LUN allocated to the Storage Group for the server being installed. The LUN must be owned by the SP connected to the boot HBA.
- During the installation procedure, only one LUN should be in the boot Storage Group, so that the boot LUN may be identified easily. After the installation, additional LUNs may be added to the host's Storage Group.

Note: If LUNs need to be created, refer to the Navisphere Management software documentation for the array type.

Preparing the host

- Create a zone that includes the WWPN of the HBA to be used and one SP port. Add the newly-created zone to the zone configuration in the fabric and enable the zone configuration.
- EMC recommends using port 0 on the SP for consistency.
- The PCI Fibre Channel HBA must be the lowest-numbered PCI slot in the server. For example, if there are three adapters in the system in slots 2, 4, and 5, connect the cable to the adapter in slot. Do not connect cables to other adapters until the installation is complete and the host rebooted.

- SCSI hard disks are allowed in SAN boot configurations. However, the BIOS for the disk's SCSI adapters must be disabled. Any SCSI disks attached to the host should be disconnected during the operating system installation.
- For servers with SCSI CD-ROM drives, ensure that the BIOS is enabled on the SCSI channel that includes the CD-ROM. Disable the BIOS on any other integrated SCSI channels.
- For servers with IDE CD-ROM drivers, disable the BIOS on the server's integrated SCSI adapter(s). The SCSI BIOS is not required to boot from the CD-ROM.
- Disable the BIOS on any other HBAs in the system other than the QLogic HBA designated for booting.

Configuring the QLogic BIOS for SAN boot

After After the BIOS is installed and enabled, it must be configured for use for booting from the SAN. The following procedure describes how to configure the BIOS.

1. Connect the CLARiiON SP fibre channel port to the adapter in the lowest-numbered PCI slot in the server.
2. Boot the server, and press CTRL-Q when the QLogic banner is displayed.

Note: Different HBA models may display different banners. Be sure to press CTRL-Q for the HBA to be configured.

The banner display corresponds to the BIOS revision pertinent to the HBAs currently installed. Refer to the EMC Support Support for specific HBAs and BIOS revisions.

3. After Fast!UTIL loads, the display depends on whether there are multiple QLogic HBAs installed:
   - If there is only one QLogic HBA, the **Fast!UTIL Options** menu appears.

- If there are multiple QLogic HBAs, a list of addresses occupied by those HBAs appears. Since the EMC storage array is attached to the lowest-numbered PCI slot, select the first adapter from the list; then press **Enter.** The **Fast!UTIL Options** menu appears.

4. From the **Fast!UTIL Options** menu, select **Configuration Settings** and press **Enter.**.
5. From the **Configuration Settings** menu, select **Adapter Settings** and press **Enter.**.
6. From the **Host Adapter Settings** menu, select **Host Adapter BIOS** and press **Enter.** to enable it if it is not already enabled.

   Note: Refer to the Table 1 on page 21 for recommended settings.

7. Press **ESC** to exit the **Configuration Settings** menu.
8. From the **Configuration Settings** menu, select **Selectable Boot Settings** and press **Enter.**.
9. From the **Selectable Boot Settings** menu, select **Selectable Boot Device** and press **Enter.** to enable this option if it is not already enabled.
10. Select **Current Boot Node Name** and press **Enter.**.

    The adapter will scan for attached storage devices which will be displayed on the screen.

    Note: Depending upon the CLARiiON array model, the HBA may not yet detect any LUNs or it may detect a LUNZ labeled device. This behavior is acceptable and to be expected.

11. Skip from the BIOS configuration to a separate host that has Navisphere Management software installed and is attached to the CLARiiON Storage Array.

    Since the operating system is not yet installed, the Naviagent / CLI is not running on the Linux host. Therefore, the HBA may need to be registered manually.

    From the management host, manually register the host's HBA and add the host to the newly created Storage Group using Navisphere Management software.
12. Return to the BIOS configuration and reboot the host.

13. When the QLogic banner is displayed (as shown in step 2), press **Ctrl-Q**.
14. Once the Fast!UTIL loads, select the **Configuration Settings** menu and press **Enter.**.
15. From the **Configuration Settings** menu, select the **Selectable Boot Settings** menu and press **Enter.**.
16. From the **Selectable Boot Settings** menu, select **Selectable Boot Device** and press ENTER to enable this option if it is not already enabled.
17. Select **Current Boot Node Name** and press **Enter.**.

    The adapter will scan for attached storage devices and a list of the available LUN(s) will be displayed. Select the CLARiiON port WWN from which the host will boot and select the LUN to be used as the boot device and press **Enter.**.

    Note: On CLARiiON Storage Arrays, the desired boot LUN is 000.

18. Press **ESC** in the **Selectable Boot Settings** menu to return to the **Configuration Settings** menu.
19. Press **ESC** in the **Configuration Settings** menu to return to the **Options** menu.
20. Select **Save Changes** and press **Enter.**.
21. Press **ESC** to exit the **Fast!UTIL** menu.
22. Reboot the host.

Installing onto the EMC storage array with the QLogic v8.x-series driver

EMC supports specific kernel and driver versions when booting from the SAN. Currently RHEL4, RHEL4 U1, RHEL4 U2, SLES9 SP1, and SLES9 SP2 in the kernel driver do not contain an EMC-qualified version of the QLogic v8.x-series driver. However, the default QLogic driver integrated into both distributions may be used for the operating system installation on an EMC Storage Array device.

When using the QLogic driver integrated into the distribution, there isn't a requirement to create a driver diskette image.

Using the installation CDs, boot the server to be installed. The installation may be performed as it would when using an internal HBA/controller driver.

Once the installation is complete, use QLogic driver installation script to upgrade the driver to the EMC-qualified driver version as follows:

```
./qlinstall -up
```

Note: Please refer to the *EMC Support Matrix* for the most recent information on qualified kernel and driver releases as well as architectures.

Upgrading the kernel

After successfully completing the installation and rebooting the host, the kernel may be upgraded to a newer kernel revision to take advantage of fixes and features incorporated into the newer kernel errata.

Note: Please refer to the *EMC Support Matrix* for supported kernel revisions.

EMC recommends installing the kernel packages, rather than upgrading them, so that either kernel version may be used for boot. In addition, if a boot diskette was created during the original installation, an updated copy should be created after the upgrade.

A

Setting Up External Boot for IBM Blade Server HS40 (8839)

This appendix contains information on setting up external boot for IBM Blade Server HS40.

- Configure HS40 BladeCenter server to boot from external array.. 74

Configure HS40 BladeCenter server to boot from external array

IBM HS40 (8839) Blade Servers encounter a dual-port HBA conflict when attempting to configure boot BIOS to boot from an external array. To configure an HS40 BladeCenter server to boot successfully follow the steps below.

1. Create a single zone containing the HBA port from which you want to boot. This prevents any conflicts with the other fibre port.
2. Configure the QLogic BIOS to boot from the EMC array as described in Chapter 3, "Configuring a Boot Device on an EMC Storage Array,".

   During server POST, be sure that the QLogic banner displays the selected boot LUN correctly before continuing.
3. Reboot the host and press **F1** to enter the server **BIOS Configuration/Setup Utility**.
4. Select **Devices and I/O Ports**, and press **Enter**.
5. Select **IDE Configuration Menu,** and press **Enter**.
6. Select the **Onboard PCI IDE Controller,** and press **Enter**. Under the options menu, set this IDE Controller to disabled. This will disable the internal IDE disk drives.
7. Press **ESC** twice to return to the **IDE Configuration Menu** and then select **Start Options,** and press **Enter**.
8. Select **Startup Sequence Options,** and press **Enter**.
9. Select **Third Startup Device,** and press **Enter**.
10. Select **HAx PortID xxxxxx xxxxx,** and press **Enter**. This boot device will be replaced as the **Third Startup Device** in the **Startup Sequence Options**.
11. Press **ESC** until you are prompted to save your changes. Then exit the **BIOS Configuration/Setup Utility**.

From this point, you may install the Linux operating system to the external boot disk using the normal Fibre Channel installation procedures described earlier in this document.

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